

WHAT IS CLAIMED IS:

1. A hole-assisted single mode optical fiber comprising:  
a first cladding region having a uniform refractive  
5 index;  
a core region with a radius  $r_1$  having a refractive  
index higher than that of said first cladding region, and  
placed at a center of said first cladding region; and  
a second cladding region including at least four air  
10 hole regions, each of which has a radius  $r_2$ , is separated  
by a distance  $d$  from a center of said core region, and is  
placed in said first cladding region, wherein  
the distance  $d$  is 2.0 to 4.5 times the radius  $r_1$  of  
said core region, and the radius  $r_2$  of said air hole regions  
15 is equal to or greater than 0.2 times the radius  $r_1$  of said  
core region.
2. The hole-assisted single mode optical fiber as claimed  
in claim 1, wherein the radius  $r_1$  of said core region is  
20 from 3.2  $\mu\text{m}$  to 4.8  $\mu\text{m}$ , and a relative index difference  $\Delta$   
of said core region from a refractive index of said first  
cladding region is in a range from 0.3% to 0.55%.
3. The hole-assisted single mode optical fiber as claimed  
25 in claim 2, wherein a mode field diameter (MFD) at a  
wavelength 1310 nm is from 7.9  $\mu\text{m}$  to 10.2  $\mu\text{m}$ .

4. The hole-assisted single mode optical fiber as claimed  
in claim 1, wherein a relative index difference  $\Delta$  of said  
core region from a refractive index of said first cladding  
region is equal to or less than 0.12%, and an effective  
5 core radius A from the center of the core region to an extreme  
circumference of said air hole regions is in a range from  
23  $\mu\text{m}$  to 28  $\mu\text{m}$ .